

# 1969

OPERATING  
SUMMARY

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## **WATERLOO**

***water pollution  
control plant***

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JUN 26 1970

ONTARIO WATER  
RESOURCES COMMISSION

ONTARIO WATER RESOURCES COMMISSION

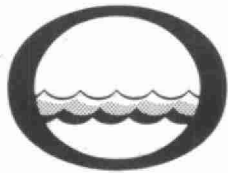
Division of Plant Operations

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*Water management in Ontario*

Ontario  
Water Resources  
Commission


135 St. Clair Ave. W.  
Toronto 195  
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.

  
D.S. Caverly,  
General Manager.

  
D.A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.

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ONTARIO WATER  
RESOURCES COMMISSION

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**WATERLOO**  
**water pollution control plant**

operated for

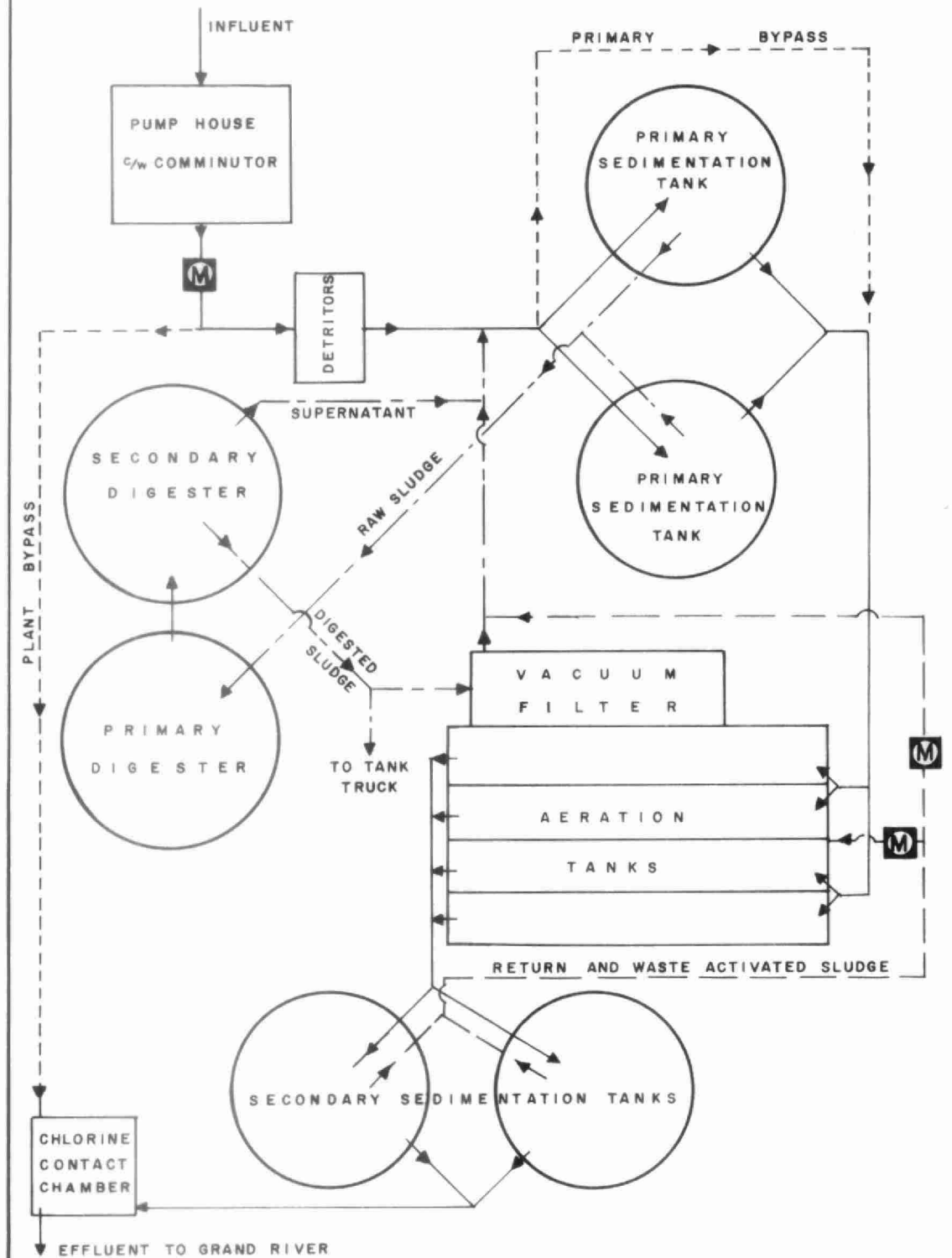
THE CITY OF WATERLOO

by the

ONTARIO WATER RESOURCES COMMISSION

**1969 ANNUAL OPERATING SUMMARY**

# WATERLOO WATER POLLUTION CONTROL PLANT



## DESIGN DATA

PROJECT NOS. 2-0022-58 and 2-0203-66			
DESIGN FLOW	6.0 mgd*	DESIGN POPULATION	30,000
BOD - Raw Sewage	300 mg/l	SS - Raw Sewage	270 mg/l
- Removal	90%	- Removal	90%

### PRIMARY TREATMENT

#### Comminution

One Worthington

#### Sewage Lift Station

Type: Canada Pump

Size: Two 2900 gpm @ 32' tdh (el)

One 5000 gpm @ 32' tdh (diesel)

#### Grit Removal

Type: Dorr Detritor

Size: Two 14' x 14' x 1.6' (3,900 gal)

Retention: 0.94 min

#### Primary Sedimentation

Type: Dorr

Size: Two 75' dia x 13' swd (0.772 mil gal)

Retention: 3.09 hours

Loading: Surface, 680 gal/ft<sup>2</sup>/day

Weir, 12,700 gal/ft/day

### SECONDARY TREATMENT

#### Aeration Tanks

Type: Diffused air, single-pass with turbine aerators

Size: Four 134' x 32½' x 15½' (1.68 mil gal)

Retention: 6.7 hours

#### Diffusers

(a) Spargers (66/tank)

(b) "Lightnin" Turbine (3/tank)

#### Air Supply

Type: Sutorbilt

Size: Two 3,750 cfm

#### Secondary Sedimentation

Type: Dorr

Size: Two 65' dia x 10' swd (0.458 mil gal)

Retention: 1.8 hours

Loading: Surface, 905 gal/ft<sup>2</sup>/day

Weir, 14,650 gal/ft/day

### CHLORINATION

Type: BIF

Size: One 400 lb/day

### OUTFALL

- to Grand River

### SLUDGE HANDLING

#### Digestion System - Two-stage

Primary - fixed cover

Type: Dorr draft tubes (3)

Size: One 80' x 21½' swd (124,500 cu ft or 0.776 mil gal)

Loading: 3.5 lb/cu ft/mo

Secondary -

Size: One 80' dia x 20' swd (117,000 cu ft or 0.73 mil gal)

Total Loading: 1.8 lb/cu ft/mo

#### Vacuum Filter

Type: Komline-Sanderson

Size: One 300 sq ft

\* Secondary clarifier 4.0 mgd design rate

# '69 REVIEW

## GENERAL

In 1969 the Waterloo water pollution control plant treated a total of 1,810 million gallons of sewage at a total cost of \$152,659.35. The operating cost per million gallons was \$84.34, and the cost per pound of BOD removed was three cents.

The vacuum filter was taken out of operation in August after labour, chemical and haulage costs made its operation uneconomical.

Plant staff under the supervision of the Division of Plant Operations operated a clean, attractive and efficient plant for the City throughout the year.

## PLANT FLOWS and CHLORINATION

The average daily flow for the year was 5.0 million gallons, an increase of 16% over 1968. The design daily flow of six million gallons was exceeded 9% of the time.

An average chlorine dosage rate of 4.1 milligrams per litre was necessary to maintain an average chlorine residual of 0.5 mg/l in the final effluent.

## PLANT EFFICIENCY

The raw sewage BOD averaged 330 mg/l, a slight increase of 9% compared to the 1968 average of 303 mg/l. The design raw sewage BOD concentration of 300 mg/l was exceeded 50% of the time.

The raw sewage suspended solids averaged 280 mg/l or 3.3% greater than design, compared to 252 mg/l in 1968. The design raw sewage suspended solids concentration of 270 mg/l was exceeded 35% of the time.



The average BOD and suspended solids in the effluent were 21 mg/l and 46 mg/l. The plant effluent BOD and suspended solids concentrations exceeded the OWRC objective of 15 mg/l 50% and 55% of the time respectively.

The average primary effluent BOD and suspended solids concentrations were 276 mg/l and 176 mg/l, respectively. While the primary clarifier average BOD and suspended solids reduction efficiencies were 17.3% and 45.1%.

### SLUDGE DIGESTION

An average of 0.60 mil. gal. of sludge per month was pumped to the primary digesters. The raw sludge averaged 5.2% total solids, of which 65% was volatile matter.

Digested sludge from the secondary digesters averaged 3.4% total solids of which 57% was volatile matter. The average reduction of volatile matter was 28.7%. This was slightly lower than existing comparative standards, but it must be remembered that these were new digesters.

### AERATION

The average MLSS concentration of 2,690 mg/l and the F/M ratio of .35 are within the accepted limits of good aeration tank operation.

## **CONCLUSIONS**

With the planned renovation of the final clarifiers, the design flow will be increased from four to approximately six million gallons a day. A significant decrease in the concentrations of BOD and suspended solids in the effluent is expected. It is also foreseen that the OWRC's objectives of 15 mg/l for both BOD and suspended solids will be met.

## **RECOMMENDATIONS**

The increase in flow to the plant has necessitated immediate renovation of the final clarification units. Renovations should start in 1970.

## PROJECT COSTS

### STAGE 1

NET CAPITAL COST (Final)	
Long Term Debt to OWRC	<u>\$728,675.93</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	<u>\$303,287.02</u>
Net Operating	\$152,659.35
Debt Retirement	26,436.00
Reserve	4,392.13
Interest Charged	<u>40,794.82</u>
TOTAL	<u>\$224,282.30</u>

### RESERVE ACCOUNT

Balance @ January 1, 1969	\$ 33,125.20
Deposited by Municipality	4,392.13
Interest Earned	<u>1,915.36</u>
	\$ 39,432.69
Less Expenditures	<u>2,082.68</u>
Balance @ December 31, 1969	<u>\$ 37,350.01</u>

STAGE 2 (Transformer Bank)

NET CAPITAL COST (Final) Long Term Debt to OWRC	\$13,226.41
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	\$ <u>4,674.53</u>
Net Operating	\$ -
Debt Retirement	552.00
Reserve	115.52
Interest Charged	<u>740.48</u>
	\$ <u>1,408.00</u>

RESERVE ACCOUNT

Balance @ January 1, 1969	\$ 1,090.50
Deposited by Municipality	115.52
Interest Earned	<u>64.56</u>
	\$ 1,270.58
Less Expenditures	<u>-</u>
Balance @ December 31, 1969	\$ <u>1,270.58</u>

2-0203-66 (Plant Extensions)

NET CAPITAL COST (Final)	\$1,273,793.57
DEDUCT - Portion Financed by CMHC/MDLB (Final)	<u>853,508.30</u>
Long Term Debt to OWRC	\$ <u>420,285.27</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	\$ <u>15,230.70</u>
Net Operating	\$ -
Debt Retirement	14,968.86
Reserve	11,591.76
Interest Charged	<u>42,328.68</u>
TOTAL	\$ <u>68,889.30</u>

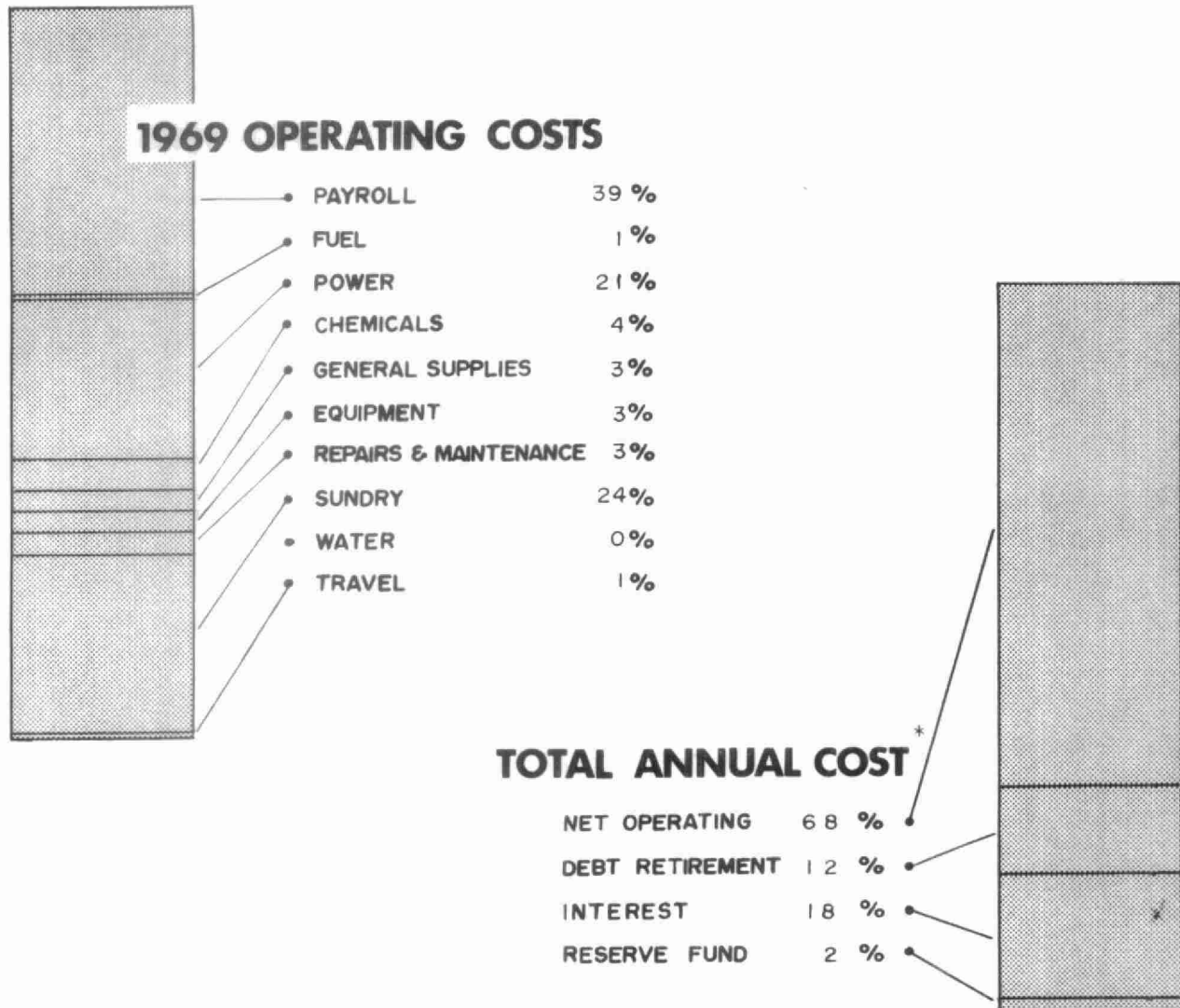
RESERVE ACCOUNT

Balance @ January 1, 1969	\$ -
Deposited by Municipality	11,591.76
Interest Earned	<u>210.24</u>
	\$ 11,802.00
Less Expenditures	<u>-</u>
Balance @ December 31, 1969	\$ <u>11,802.00</u>

SPECIAL OPERATING AGREEMENT

RESERVE ACCOUNT

Balance @ January 1, 1969	\$3,738.12
Deposited by Municipality	1,237.33
Interest Earned	<u>240.31</u>
	\$5,215.76
Less Expenditures	<u>-</u>
Balance @ December 31, 1969	<u><u>\$5,215.76</u></u>



### Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	924.09	\$140,427.32	\$151.98	4 cents
1966	1139.85	120,343.71	105.58	4 cents
1967	1456.86	142,609.57	97.89	4 cents
1968	1533.7**	138,403.88	90.24	3 cents
1969	180.1	\$152,659.35	\$84.34	3 cents

\*\* Estimated on 183 days' data

\* Stage I only

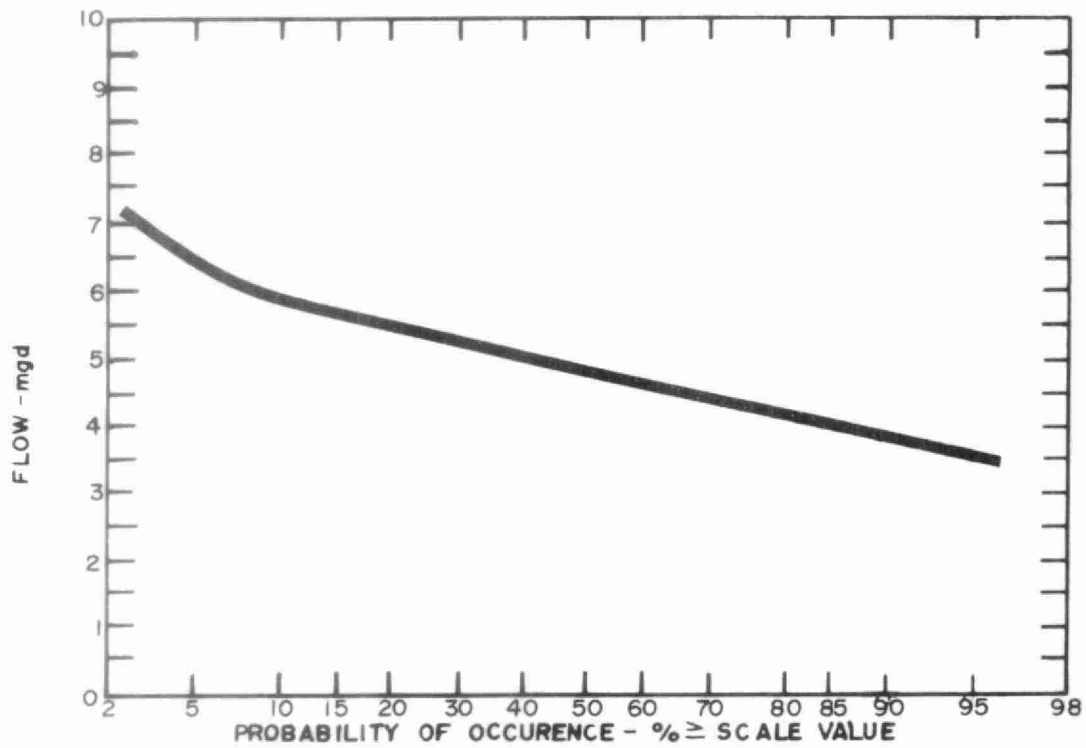
## Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	9465.61	6140.11	-	(698.10)	2901.30	30.47	135.73	683.50	40.55	102.70	-	129.35
FEB	11787.42	4328.83	-	908.54	2755.82	2181.93	241.41	1164.65	-	69.67	-	136.57
MAR	9831.26	4293.71	-	760.43	2689.88	-	532.08	757.96	119.43	639.43	-	38.34
APR	9982.33	4445.76	-	171.55	2530.36	175.29	575.10	(129.49)	301.96	1813.93	-	97.87
MAY	11226.45	4767.52	164.50	159.74	2849.10	-	561.04	103.24	680.07	1899.20	-	42.04
JUNE	11038.75	4793.71	347.32	-	2768.26	-	502.77	244.31	68.42	2218.58	-	95.38
JULY	12735.25	4403.29	340.36	-	2613.89	1866.90	512.81	56.89	556.51	2250.35	-	134.26
AUG	11701.86	6597.89	530.14	309.92	2807.31	-	408.96	-	967.78	1.62	-	78.24
SEPT	14817.19	4249.56	34.08	205.62	2910.41	-	560.10	-	1058.12	5666.97	-	132.33
OCT	14536.99	4435.50	-	-	-	-	521.72	73.97	161.80	9222.98	-	121.02
NOV	14313.20	4420.52	-	-	5598.90	1866.90	252.03	1942.95	171.65	60.25	-	-
DEC	21223.03	4416.90	-	447.60	2387.00	-	344.64	75.08	512.39	12735.90	-	303.52
TOTAL	152659.35	57293.30	1416.40	2265.30	32812.23	6121.49	5148.39	4973.06	4638.68	36681.58	-	1308.92

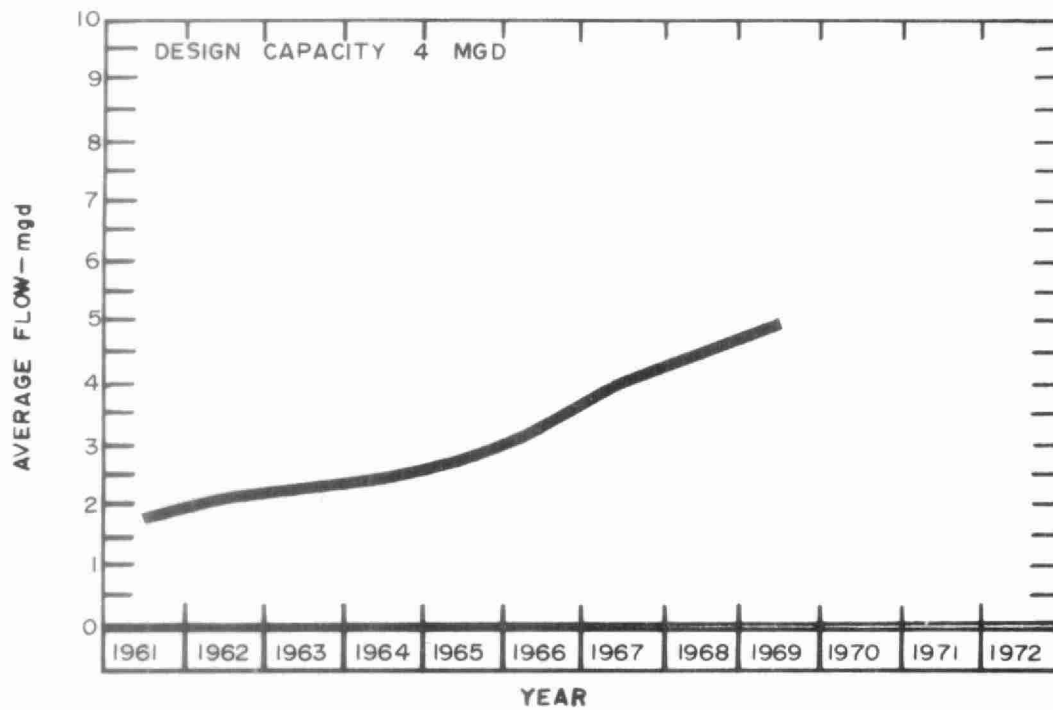
BRACKETS INDICATE CREDIT

\* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE \$26,483.78

## PROCESS DATA



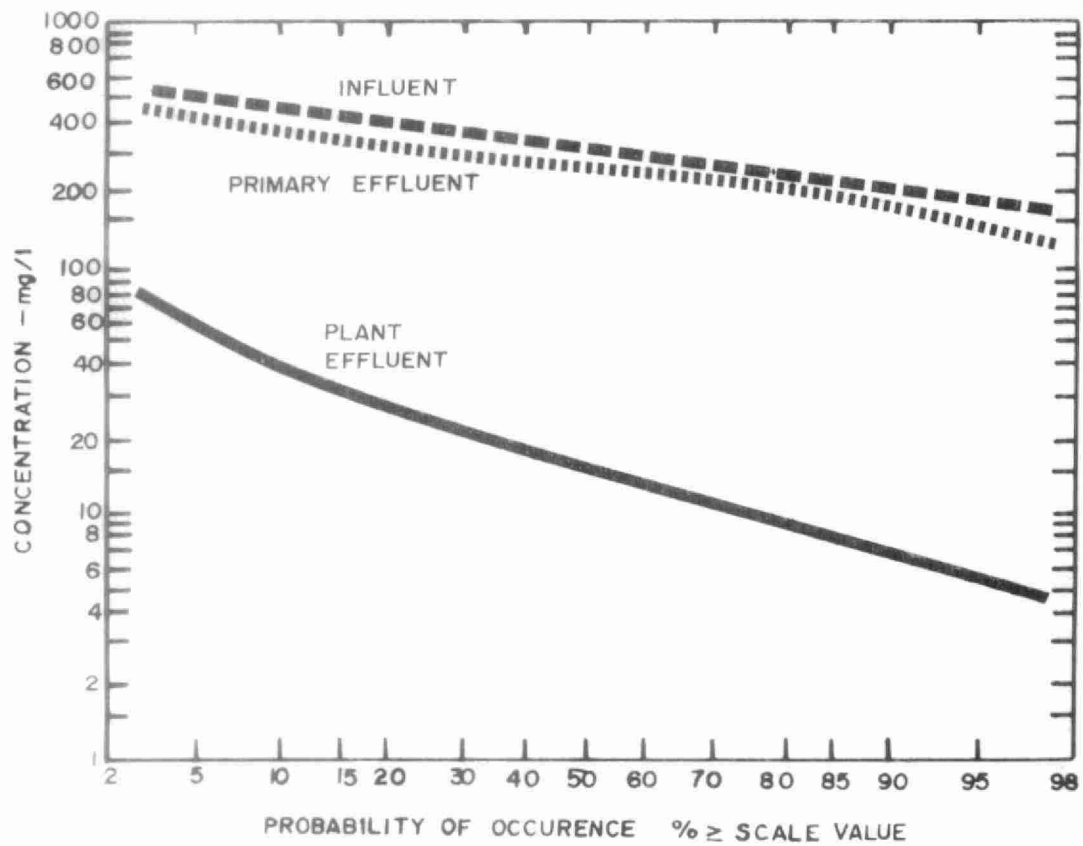
## FLOWS



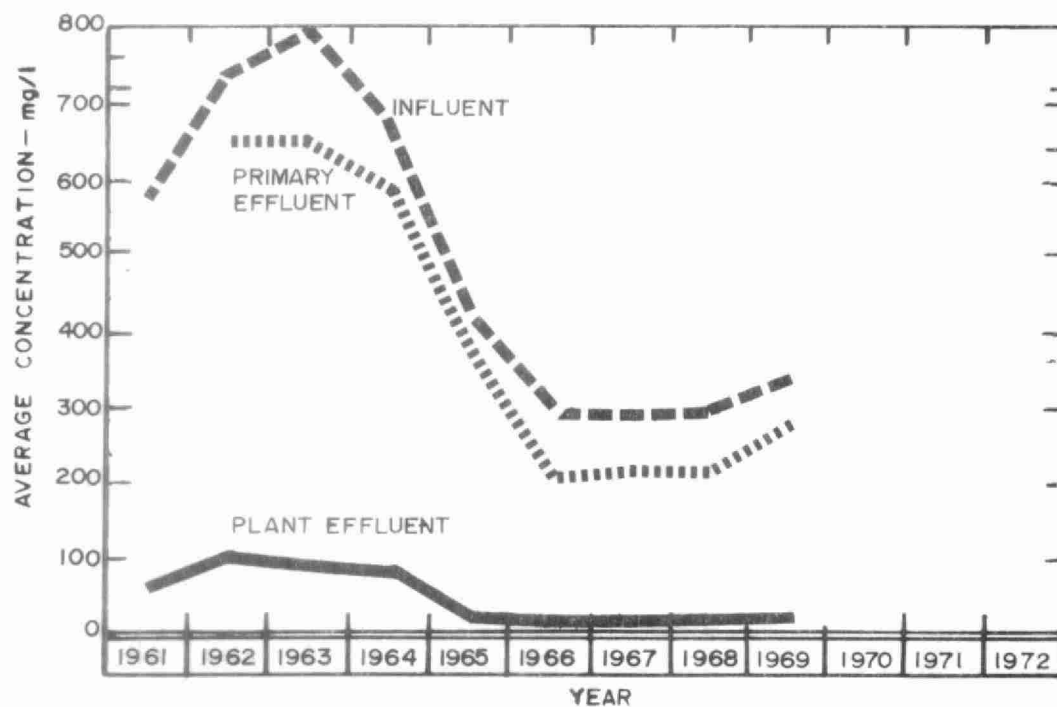


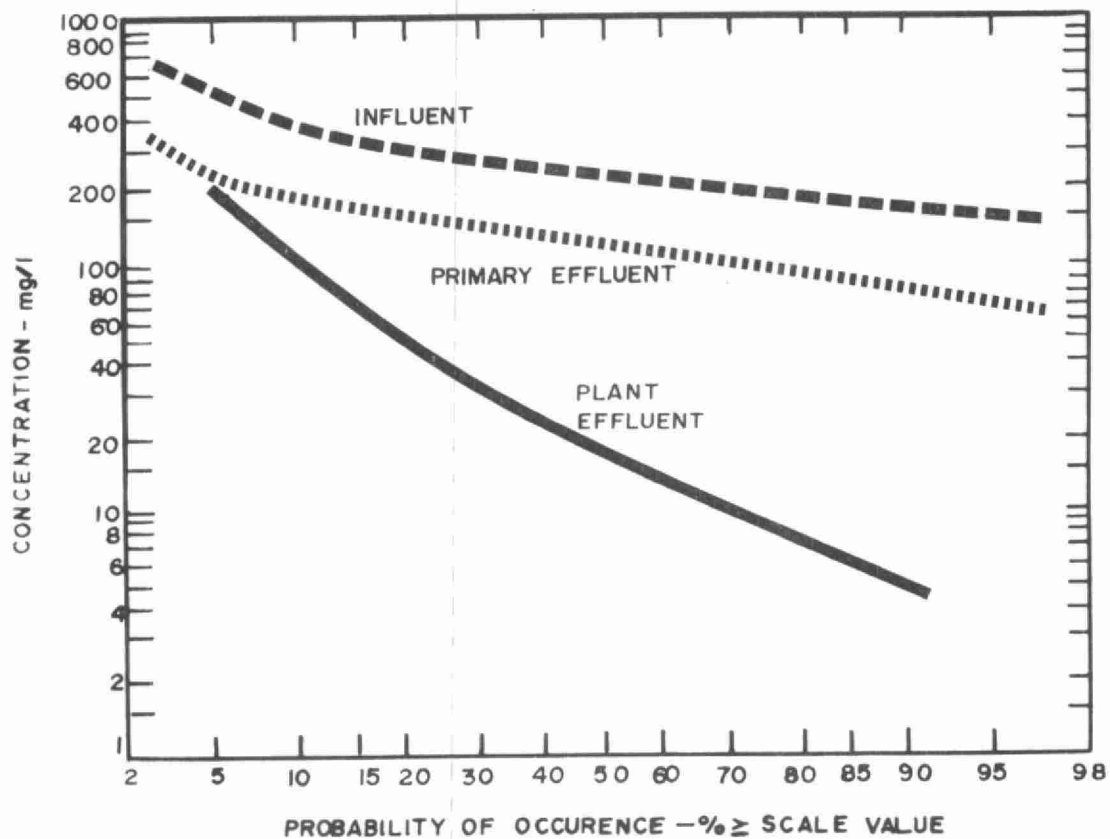
## PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10 <sup>3</sup> pounds	DOSAGE mg/l
JAN	149.1	4.8	6.4	3.1	7.79	5.2
FEB	154.4	5.5	7.9	4.0	2.79	1.9
MAR	160.6	5.2	9.0	3.9	5.04	3.1
APR	142.9	4.8	9.0	4.0	6.84	4.8
MAY	165.7	6.3	6.3	3.8	6.30	3.8
JUNE	158.4	5.2	9.2	4.0	6.52	4.1
JULY	147.2	4.8	8.1	3.2	6.14	4.2
AUG	143.0	4.6	6.5	2.2	6.12	4.3
SEPT	137.6	4.6	5.3	3.4	7.70	5.6
OCT	146.5	4.7	5.4	3.2	5.99	4.1
NOV	156.7	5.2	6.1	4.1	5.50	3.5
DEC	148.0	4.8	5.6	3.2	7.28	4.9
TOTAL	1810.1	-	-	-	74.21	-
AVERAGE	-	5.0	-	-	6.18	4.1

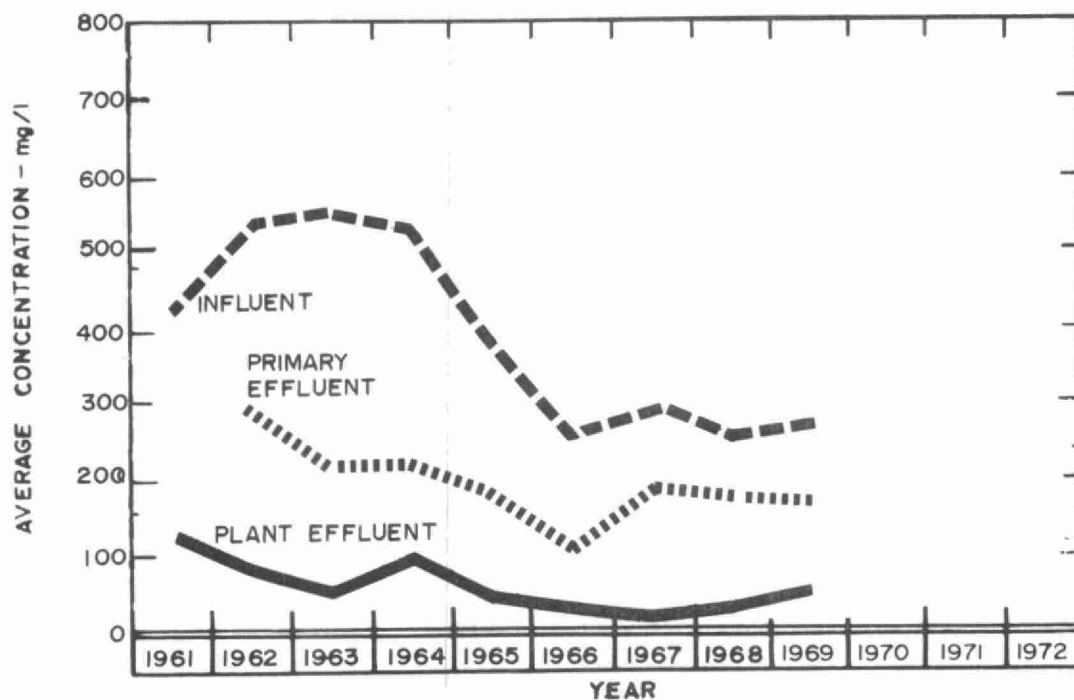


## BIOCHEMICAL OXYGEN DEMAND





## SUSPENDED SOLIDS

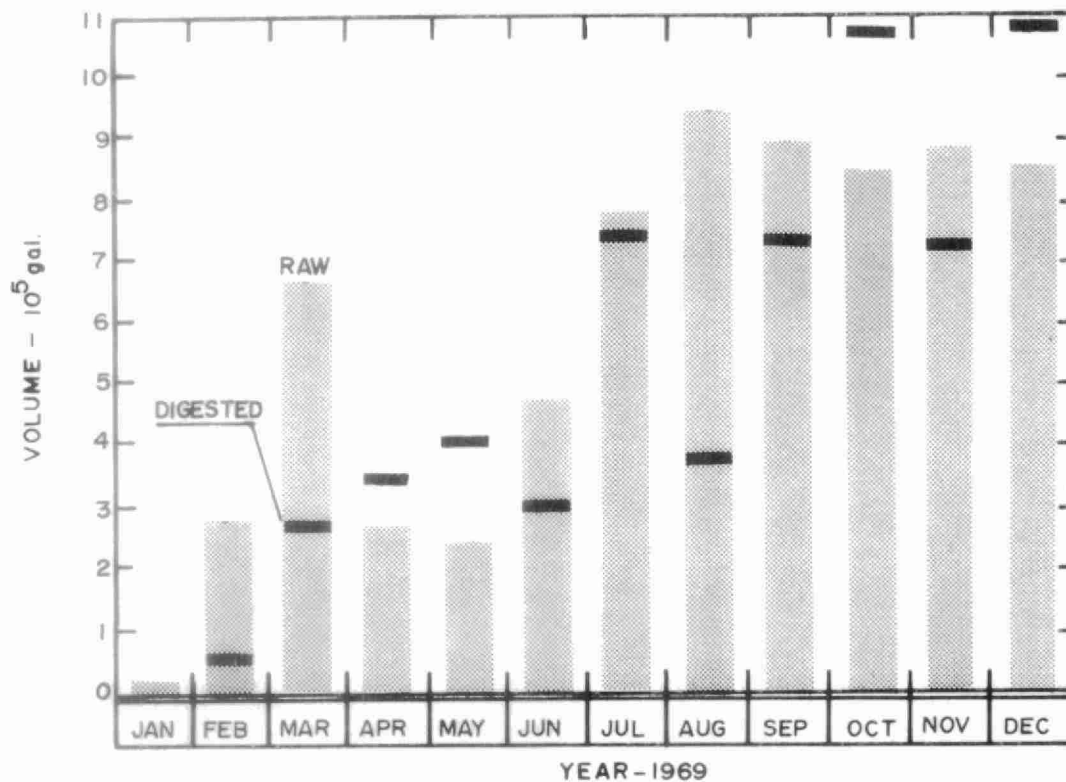


## PLANT EFFICIENCY

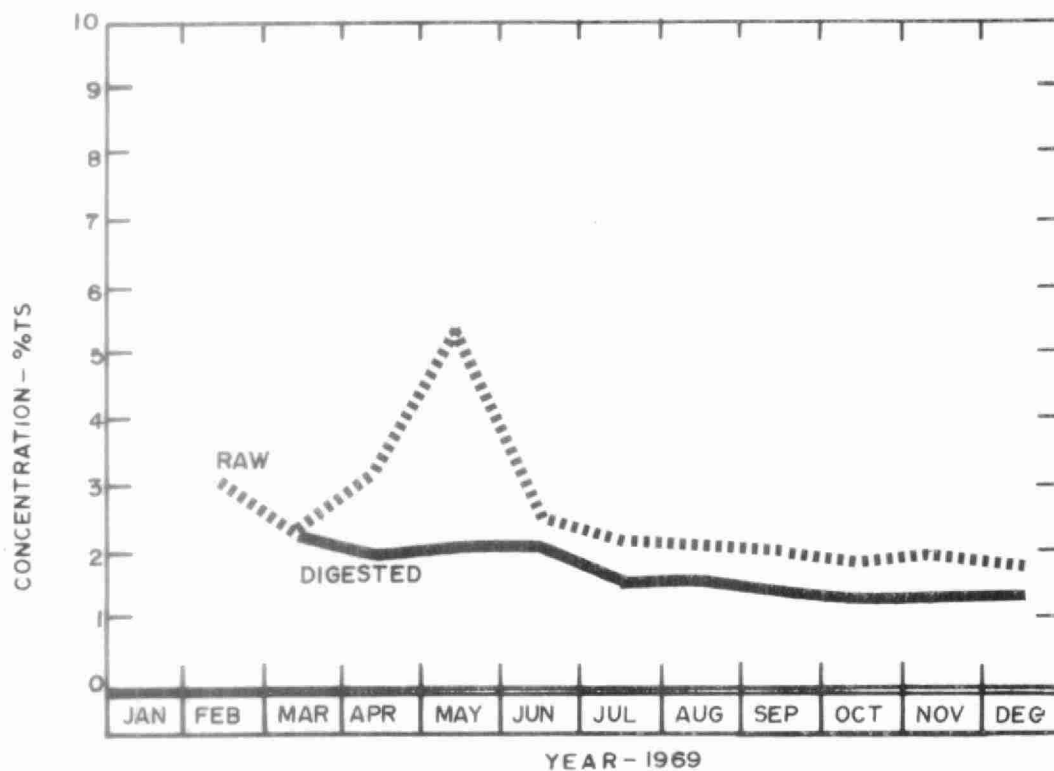
MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF. mg/l	EFF. mg/l	REDUCTION		INF. CONCN mg/l	EFF. CONCN mg/l	REDUCTION		
			%	10 <sup>5</sup> pounds			%	10 <sup>5</sup> pounds	cu
JAN	660	30	95	9.4	386	42	89	5.1	300
FEB	-	-	-	-	-	-	-	-	100
MAR	345	43	88	4.8	251	80	68	2.7	200
APR	320	31	90	4.1	258	131	49	2.8	200
MAY	270	26	90	4.0	216	117	46	1.6	200
JUNE	319	21	93	4.8	283	32	89	4.0	100
JULY	307	10	97	4.4	272	18	93	3.7	200
AUG	300	10	97	4.1	285	13	95	3.9	268
SEPT	244	13	95	3.2	352	6	98	4.8	200
OCT	274	15	94	3.8	254	12	95	3.5	200
NOV	309	15	95	4.6	253	24	91	3.6	200
DEC	287	18	94	4.0	273	32	88	3.6	400
TOTAL	-	-	-	-	-	-	-	-	2568
AVERAGE	330	21	94	4.7	280	46	83	3.5	214

## AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF.		SECONDY. EFF.		MLSS CONCN mg/l	F/M lb BOD lb MLSS	AIR USED 1000 cu ft lb BOD	WASTE SLUDGE 10 <sup>4</sup> pounds
		BOD	SS	BOD	SS				
		mg/l	mg/l	mg/l	mg/l				
JAN	4.81	300	113	50	86	1570	.61	.47	0
FEB	5.51	-	-	-	-	2810	-	-	8.1
MAR	5.18	462	623	43	80	3460	.46	.26	2.7
APR	4.76	315	238	31	137	2980	.33	.42	7.0
MAY	5.35	255	101	26	117	2700	.33	.46	1.7
JUNE	5.28	282	140	21	32	3090	.32	.75	11.2
JULY	4.75	243	126	10	18	2830	.27	.51	9.1
AUG	4.61	232	133	10	13	2730	.26	.55	17.4
SEPT	4.58	211	133	13	6	2740	.24	.62	6.3
OCT	4.72	239	108	15	12	2620	.29	1.35	5.5
NOV	5.22	275	107	15	24	2280	.42	.41	2.1
DEC	4.77	216	118	18	32	2500	.27	.60	2.3
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	5.0	276	176	23	50	2690	.35	.58	6.7



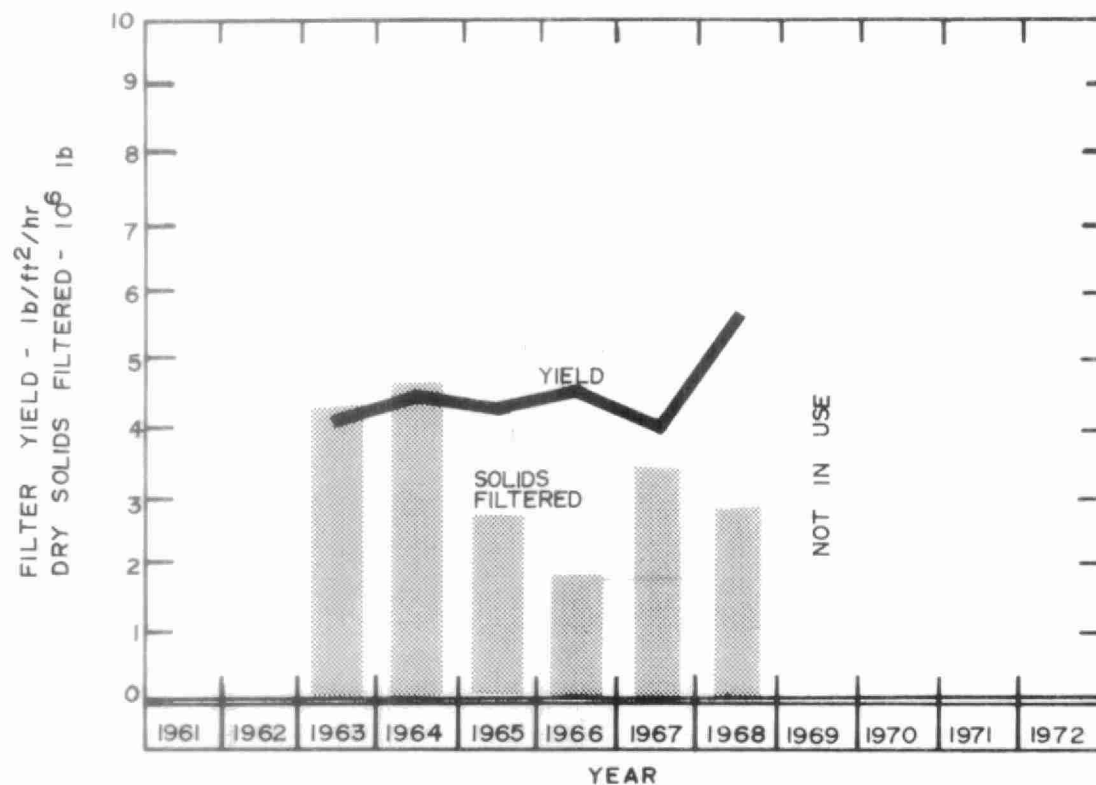
## DIGESTION



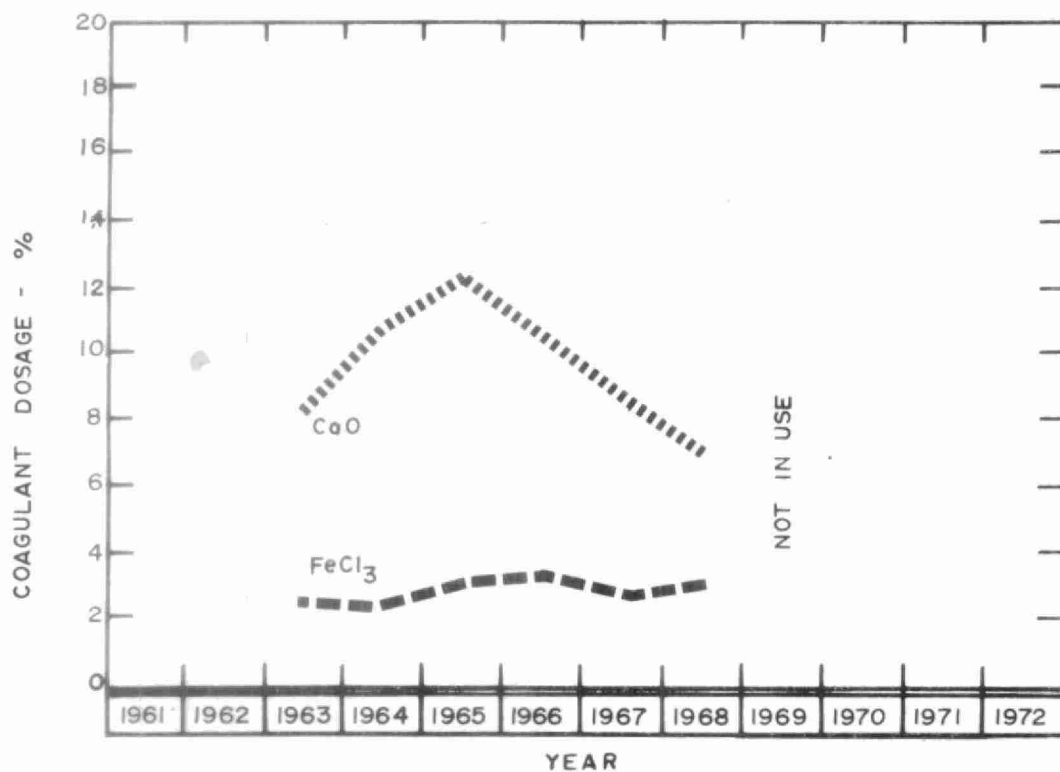
## SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME	TOTAL SOLIDS	VOL SOLIDS	VOLUME	TOTAL SOLIDS	VOL SOLIDS	VOLUME	TOTAL SOLIDS	DEWATERED	LIQUID
	10 <sup>5</sup> gal	%	%	10 <sup>5</sup> gal	%	%	10 <sup>3</sup> gal	%	cu yd	cu yd
JAN	0.2	-	-	0	-	-	63.1	-	0	0
FEB	2.9	6.1	66	.6	-	-	0 *	-	0	336
MAR	6.7	4.8	65	2.8	4.5	66	0	-	0	1673
APR	2.8	6.5	64	3.4	3.9	63	0	-	0	2012
MAY	2.6	10.7	60	4.0	4.4	60	0	-	0	2401
JUNE	4.9	5.3	66	3.1	4.2	56	0	-	0	1828
JULY	7.8	4.3	63	7.5	3.1	53	0	-	0	4483
AUG	9.3	4.3	59	3.9	3.3	53	0	-	0	1835
SEPT	8.9	4.0	66	7.3	2.6	-	80.0	-	0	4287
OCT	8.5	3.7	72	10.8	2.5	54	0	-	0	6256
NOV	8.9	4.0	66	7.3	2.6	-	0	-	0	4287
DEC	8.5	3.7	72	10.8	2.5	54	0	-	0	6256
TOTAL	72.0	-	-	61.5	-	-	143.1	-	0	35654
AVERAGE	6.0	5.2	65	5.1	3.4	57	0	-	0	2971

\* Meter out of service

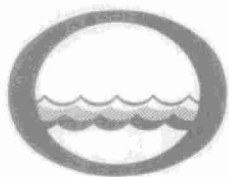


## VACUUM FILTRATION





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***Water management in Ontario***